A series converges absolutely if $\sum |a_n|$ converges, so does $\sum a_n$. An alternating series converges if $\lim_{n \to \infty} a_n = 0$ and $\{a_n\}$ is a decreasing sequence. The alternating series test states that if $\lim_{n \to \infty} |a_{n+1}/a_n| < 1$, then the series converges.

**Note:** If the Ratio Test succeeds in showing $\sum |a_n|$ converges, it also shows that $\sum a_n$ converges.

Today: How to handle series that have both infinitely many terms and only a few positive terms. How to handle series that have (at least eventually) only positive terms.

Where $\sum a_n$ converges, $\{a_n\}$ is bounded. A sequence $\{a_n\}$ is bounded if $\exists M \geq 0$ such that $-M < a_n < M$. Hence, they both converge.

**Proof:** reasoning of partial sums. The sequence of partial sums $S_n, S_2, S_3, S_4, \ldots$ is a sequence, so $\{S_n\}$ is bounded because every partial sum is a sum of terms.

If $\sum 1/n$ diverges and $\sum a_n$ converges, we say $\sum 1/n$ diverges. Otherwise, $\sum a_n$ converges. Otherwise, $\sum a_n$ diverges.

Ex: $\sum_{n=1}^{\infty} (-1)^n/n = 1 - 1/2 + 1/3 - 1/4 + \cdots$. This is an alternating harmonic series.
Bounds: If $S_n - S_{n-1} = 1/n+1$, then
\[ \lim_{n \to \infty} a_n = 0, \text{ then} \]
\[ \sum_{n=1}^{\infty} a_n = 1. \]

If $3q, 13$, is decreasing and \[ \text{suppose} \ M_n \text{ an alternating series,} \]
\[ \text{converge, so} \ \sum \text{ always have} \]
\[ \text{an alternating series} \]
\[ \text{neighbor} \text{ converges,} \]
\[ \text{either} \text{ for} \]
\[ \text{so an} \text{ and anti always have} \]

\[ \text{diverges.} \]

\[ \sum_{n=1}^{\infty} \frac{(-1)^n}{n} \]
\[ \text{converges conditionally.} \]

\[ \sum_{n=1}^{\infty} \frac{(-1)^n}{n} \]
\[ \text{converges,} \text{ absolutely.} \]

\[ \sum_{n=1}^{\infty} \frac{(-1)^n}{n} \]
\[ \text{converges,} \text{ conditionally.} \]